MCP361 Assignment 5

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Question 1

```
--- Doctor ---
Best fit: Gaussian distribution with mean=2.543749679858944, std=0.5760625818525035
--- NCD Nurse ---
Best fit: Exponential distribution with lambda=2.996229586528595
--- Pharmacist ---
Best fit: Exponential distribution with lambda=1.4914429003961256
```

Figure 1: Results for Question 1

Question 2

Metric	Value
Average total time in system	8.483610779085653
Average Wait Time - Doctor	0.7983568940742285
Average Wait Time - Nurse	0.6410446583909187
Average Wait Time - Pharmacy	0.17601091241274583
Utilization - Doctor	0.4745950925732512
Utilization - Nurse	0.3204116634587564
Utilization - Pharmacy	0.26732367642394206

Figure 2: Results for Question 2 with simulation count 1

Question 3

Metric	Mean Value	Standard Deviation
Average total time in system	8.483610779085655	1.5545713512953032e-15
Average Wait Time - Doctor	0.7983568940742288	1.1104081080680737e-16
Average Wait Time - Nurse	0.6410446583909188	1.1104081080680737e-16
Average Wait Time - Pharmacy	0.17601091241274577	0.0
Utilization - Doctor	0.4745950925732513	5.552040540340369e-17
Utilization - Nurse	0.3204116634587564	0.0
Utilization - Pharmacy	0.26732367642394206	5.552040540340369e-17

Figure 3: Results for Question 3 with simulation count 100

Observations

- **Average Total Time:** Clients spend an average of 8.48 units in the system, indicating a significant overall service time.
- **Average Wait Times:** The doctor has the longest wait time (0.80 units), suggesting a potential bottleneck. The pharmacy has the shortest wait time (0.18 units).
- **Utilization Rates:** The doctor's utilization (47.46%) is the highest, highlighting possible resource strain. The nurse and pharmacy have lower utilization rates (32.04% and 26.73%, respectively), indicating potential overcapacity.
- **Standard Deviations:** Small deviations across metrics suggest stable and predictable system performance.

Final Interpretations

- **Performance Bottlenecks:** The doctor's higher wait time and utilization may indicate a need for increased capacity or efficiency improvements.
- **Resource Allocation:** Consider reallocating resources or increasing capacity in areas with high demand, such as the doctor.
- **System Efficiency:** The system is stable, but reducing the overall time clients spend in the system could improve efficiency.